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ABSTRACT

This paper discusses changes in services, technology, and organization as libraries prepare to enter the "network-centric library world." Part 1 addresses the transition from the analog era to the digital age, and the convergence of libraries and education, including opportunities for library leadership in Internet access, digital literacy, and digital pedagogy. A technology vision for libraries in the digital age is presented in Part 2, covering the following topics: a vision for readers' access to information in all formats; the library automation industry in 1998; goals and objectives of library information strategies in the digital age; implications of interactive television for home access to the Internet, including "couch potato interfaces" that are easier to use than automated library systems; feasible goals for library technology, including graphical user interfaces, access to digital information resources, and connection to the Internet; a vision for public access to information in all formats from the library's point of view; and a vision from the user's point of view for use of information technology in the library. Part 3 describes the network-centric digital library world and library resource-sharing. Figures include a list of key technologies/services to be considered for libraries, information infrastructure diagrams, and an outline of possibilities for library resource-sharing. (Contains 6 figures and 2 tables.) (MES)

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LIBRARY RESOURCE-SHARING IN THE NETWORK-CENTRIC WORLD

A Paper Prepared for the
International Association of Technology University Libraries (IATUL) Conference
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by Rob McGee
26 May 1998

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PREFACE

In Transition from the Analog Era to the Digital Age

Our civilization is in transition from the Analog Era, where information has been represented primarily in Analog -- or Print -- form, to the Digital Age, where information is being created and distributed in Digital -- or Electronic -- form. Librarianship is at a turning point -- the advent of the Digital World will impact libraries as no other trend has. Libraries are challenged to organize access both to traditional analog (print-form) information, and to the exploding world of digital information resources available through the Internet/World Wide Web. As libraries poise to offer new and enhanced services for the next century, it is time to replace the basic technologies and to adapt and re-structure library organizations and operations for the "Network-Centric Library World."

RMG's mission is to assist libraries with transition to coherent systems of access to both Analog and Digital Information Resources.

RMG Consultants, Inc. was founded in 1980 by Rob McGee to assist libraries worldwide to plan, procure, and implement computer based systems and services.
RMG's professional staff provide services from two U.S. locations (our Central office in Chicago, and an East Coast office in Bethesda, Maryland) and from the offices of our affiliated company, RMG Information Consultants Pty, Ltd., of Melbourne, which provides professional consulting services to libraries in Australasia and Asia. Rob McGee, President, and Patrick McClintock work from the Chicago office, and Howard Harris works from the Bethesda office. Geoff Payne works from the Melbourne Office.

Since 1993 RMG has emphasized "Information Strategies for Libraries," to position our clients (as well as the library industry) to confront the risks -- and opportunities -- of the Digital Age. The rapid changes in computers and telecommunications have led to library and information industry products and services that provide new approaches and tools for collaborative library systems and services.

RMG is fortunate to have engaged in a series pioneering projects that have allowed us to plan national, state, and regional library networks and systems that take advantage of new technologies and the

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opportunities they present for library resource-sharing. PART 1:

AT THE TURNING POINT
In Transition from the Analog Era to the Digital Age

Our civilization is in transition from the Analog Era, where information has been represented primarily in Analog -- or Print -- form, to the Digital Age, where information is being created and distributed in Digital -- or Electronic -- form. Librarianship is at a turning point -- the advent of the Digital World will impact libraries as no other trend has. Libraries are challenged to organize access both to traditional analog (print-form) information, and to the exploding world of digital information resources available through the Internet/World Wide Web.

The "Digital Convergence" of computing/communications/consumer electronics/media /entertainment/publishing technologies and industries is producing easy-to-use seamless interfaces, high-bandwidth telecommunications services, affordably priced computing power and storage, and digital content. Altogether, these forces constitute a "sea change" that is recasting the ways in which our culture -- and libraries -- handle information. Libraries are confronted by the risks and opportunities of the Digital Age.

The intensity and pace of the evolving "Consumer-Oriented Information Age" is being driven by the relentless onslaught of technology. In particular, increasingly powerful CPUs are yielding revolutionary gains in computer price/performance, which coupled with significant developments in operating systems, telecommunications, and multimedia technology are enabling long-envisioned "Electronic Futures" to become affordably-positioned consumer products and services.

Giants of the computer and communications industries are watching their traditional strengths being threatened and eroded by the "paradigm shifts" in business and industry that the breakthrough technologies are forcing. Unprecedented alliances have formed by the dozens among companies suddenly thrust into an era where complementary strengths, products, and services in key arenas are required for protection and gain of market share in what has turned rather quickly into a "Consumer-Oriented Information Age."

These cascading technological and business developments among the giants of the "Conglomerated Information Industry" will lead to paradigm shifts in the education and library industries and their somewhat esoteric niches where specialized publishers, booksellers, book jobbers and distributors, and information services organizations provide digital and analog publications to primary and secondary schools, colleges, and universities, and to the libraries, students, teachers, and faculties of these institutions.

The Convergence of Libraries and Education: Opportunities for Library Leadership in Internet Access, Digital Literacy, Digital Pedagogy

As we enter the Digital World much of the information needed by library users that yesterday was available in print form is today being distributed in digital form.

Our librarians, teachers, faculty -- and library users -- need to be re-oriented, re-equipped, re-trained with the tools and techniques of the Digital Age. In the Analog World, librarians and educators used printed books and journals found in library collections. Now, in addition, they must take advantage of digital information resources -- particularly Internet/WWW Resources -- to develop new forms and sources of information for the educational process.

The emergence of digital books and libraries is coming fast. Our libraries' and schools' people, processes, and institutions, must be re-tooled for the Digital Era -- librarians, library users, educators, and students must be trained and equipped to be competent users of information in the digital age.

The basic tools of the Digital Era are Personal Computers and the Internet -- access to networked information is the way of the Digital World. In a school or library the most effective use of personal

computers and the Internet requires access to a telecommunications network that connects users to each other, and to digital information resources both within the institution on its network, and worldwide through the Internet.

Communications networks are complicated and expensive undertakings. Some institutions may lack the human resources to track, to understand, and to plan for the latest information technology and may not have the interest, inclination, or energy to make expensive investments in telecommunications networks and personal computers for users. Libraries, even when financially-disadvantaged, are still the primary information resources for their communities and institutions, and must provide universal service to their constituents. Libraries are educational resources for everybody - - the citizens, the business community, school kids, college and university students, faculty. If libraries do not have adequate information infrastructure, then their users simply will be disenfranchised from the Digital World, and will miss opportunities to become "digitally literate." They will miss a chance to become participants in the Digital Library World.

Libraries are essential to their local communities and culture, and are cornerstones of democracy and the educational system In the Analog World, libraries purchased print material, and borrowed books they could not afford to buy. In the Digital World, public libraries must: help us avoid becoming a global society of "information haves "and "information have-nots," by providing universal access to information in all format -- Analog and Digital -- for their readers.

If academic institutions and libraries, and public libraries, do not have adequate information infrastructure, then their graduates and users simply will not become "digitally literate" and they will not be equipped or knowledgeable participants in the Digital World.

Responsible public libraries and academic institutions must help users become digitally literate, and empower them to become full-fledged citizens of the Digital World. How can we do this in libraries where staff do not employ, teach, or provide for users -- or require students to use -- standard information tools and technology?

How can librarians in the Digital Age -- when daily exchange of information on virtually any topic flows through the Internet -- remain credible if they do not have basic opportunities or skills to use Personal Computers and the Internet?

The problem for communities and academic institutions with libraries that do not have adequate information technology is that the longer they wait, the further behind they get, and the more opportunities are lost for their users to enter the Digital Library World!

In the Analog World, librarians have been their communities' information specialists, and they still should be in the Digital World -- they are the people who should help users find both Analog and Digital information Computer and networking people design, implement, and operate computer networks and information systems. Librarians should be responsible for training, assistance, ongoing support of information users: both "Library Users" and "Internet Users."

The special role of academic librarians in the Digital Age is not only to be the campus information specialists in both the Analog and Digital Worlds, and to be responsible for training, assistance, and support of campus information users: library users, Internet users, but also to play leadership roles in the choices of campus user interfaces: Web browsers, HTTP/Z39.50 servers, proprietary interfaces, navigational tools.

Academic librarians should lead in the development and administration of institutional policy for access to digital information resources -- for budgeting, allocation of budgets, and management of funds for institutional access to digital content -- and for choice of content, licensed access, and pay-for-view access. The academic library should be a place on campus that provides an Internet connection available to everybody in the institution, and that provides staff easily available to users for instruction, training, and assistance.

The academic library in the Digital Age should be a place for citizens, students, faculty to go for "hands-on" help and assistance in using the Internet, and finding wanted information -- both Analog and Digital.

In Conclusion

In the transition from the Analog Era to the Digital Age, libraries are at a turning point -- they must assert their roles in the Digital World.

- Libraries must seize opportunities for leadership in the Digital World.
- Digital libraries should be established by librarians
- Libraries and librarians in the Digital World should strive for the same:
  Mission -- Values -- Ethics
  that we have had in the Analog World.
- Public libraries must champion universal access to Digital Information resources
- Academic libraries should lead their institutions to new
  Pedagogical Resources
  Information Tools
  of the Digital Age.

PART 2:

A TECHNOLOGY VISION FOR LIBRARIES IN THE DIGITAL AGE
A Vision for Readers' Access to Information in All Formats

The goal of the Library is to provide readers with the best possible access to needed information in both Analog and Digital formats, and to give taxpayers and other funders the best possible return on investments in libraries and information resources.

The Library's information strategy must be to provide users with coherent access both to traditional print-form books and journals in library collections, as well as to digital information resources available through the statewide network on computers throughout the library system, as well as from information services and sources accessible through the Internet/World Wide Web.

Readers' access to information will be "network-centric" -- readers will be connected electronically to catalogs and indexes of information in libraries' print collections and electronic databases, and to full-text, abstract, and index databases available from commercial providers on a subscription and pay-for-view basis from computers on the Internet/WWW.

The Library's vision is to deliver to users ready access to the rapidly emerging digital library world of the Internet/World Wide Web. This comes at a time when the fundamental role of free public libraries in our society is challenged by the emergence of electronic information resources that must be paid for at prices not affordable by all. The tradition of free public libraries is at risk at this moment in the advent of the Digital Age, as the trend of providing electronic information on a pay-for-view and subscription basis is clearly growing.

Academic libraries can neither afford to buy all print books and journals of interest, nor subscribe to all wanted electronic resources. In the Analog Era interlibrary lending and borrowing was the compensating mechanism. In the Digital World academic libraries must seek ways to share electronic resources on an as-needed basis.

For-pay access to digital information resources on a transaction basis will address this in part. However, the needed societal solution will be to change the paradigm of scholarly publication in order to take advantage in the Digital World of the inherent efficiencies of digital publishing and network distribution.

As our society makes the transition to the Digital Age, where information is created and distributed in digital form, our libraries and library users must be oriented to and equipped with the tools and

techniques of the Digital Era. We must re-tool our librarians and users to be competent users of digital information. We must provide an adequate information infrastructure to prevent our citizens from becoming disenfranchised from the Digital World and missing opportunities to become "digitally literate."

Implementation of new technologies will allow libraries to provide more and better service to patrons, in part due to new or improved access to information resources, that should be accompanied by re-engineering library organizations' structure, processes, and workflow to allow re-allocation of human resources to service-related tasks.

The Library Automation Industry in 1998

Today's library technology market is highly dynamic, with significant enhancements being rolled out at an ever- increasing pace, driven by improvements in base computing and telecommunications technologies and by extremely competitive forces in an industry that can no longer support the same historic array of vendors and products. Graphical user interfaces, transparent gateway products, access to local, regional, and international networks and the Internet/World Wide Web, and the slow but inevitable move toward client/server based architectures, object-oriented software development, and fourth generation relational database management tools and products are all factors responsible for this new climate.

As libraries poise to offer new and enhanced services for the next century, it is time to replace the basic technologies and to adapt and re-structure library organizations and operations for the "Network-Centric Library World." The emergence of Global, National, and Local Information Infrastructure (GII, NII, LII -- see Part 3) and the cascading developments of the "Digital Convergence" of the computer/communications/consumer electronics/entertainment industries, have introduced a new era for libraries. RMG believes that the following considerations should become the goals and objectives of information strategies for libraries.

GOALS AND OBJECTIVES OF LIBRARY INFORMATION STRATEGIES IN THE DIGITAL AGE

- 4 GOALS OF A LIBRARY INFORMATION STRATEGY
    1. EASY-TO-USE PUBLIC ACCESS SYSTEMS TO BOTH ANALOG AND DIGITAL INFORMATION RESOURCES
    2. EASIER AND COMPREHENSIVE ACCESS TO ANALOG (PRINT) RESOURCES
    3. ENHANCED AND AFFORDABLE ACCESS TO DIGITAL INFORMATION RESOURCES
    4. HIGH-BANDWIDTH CONNECTION TO INTERNET
- OBJECTIVES OF A LIBRARY INFORMATION STRATEGY
    - BECOME "NETWORK-CENTRIC"
    - ANTICIPATE THE ADVENT OF DIGITAL LIBRARIES
    - LEVERAGE TRADITIONAL LIBRARY ANALOG INFORMATION RESOURCES
    - RE-ENGINEER LIBRARIES FOR THE DIGITAL AGE
    - LEVERAGE HUMAN RESOURCES

Implications of Interactive TV for Home Access to the Internet:
"Couch Potato Interfaces" that are Easier to use than Automated Library Systems

The advent of interactive television is now focused on access to the Internet/WWW, and is leading to development of interfaces for home users that to be workable must be simple -- "Couch Potato Interfaces" will be very user friendly! It is just a matter of time before information services will be delivered into the home, including access to some of the same electronic databases that heretofore have been available to library users through rather difficult "character" interfaces.

The prospect that libraries must face is the provision by telephone, television, and cable television companies -- plus the up and coming new wireless players -- of digital information services to users in

their homes and workplaces, through interfaces that are easier to use than those currently provided by automated library systems and university networks.

The challenge for libraries is to provide improved access and interfaces to digital information resources. which means that libraries should implement:

- Graphical User Interfaces
- That operate on personal computers -- no more dumb terminals!
- That attach to libraries' Wide-Area Networks (WANs) or Local Area Networks (LANs),

in order to provide a greatly expanded set of capabilities for access to Analog and Digital information resources.

Feasible Goals for Library Technology: Graphical User Interfaces

The provision by libraries of easy-to-use Public Access Systems to information in both analog and digital formats should be a goal for new systems and services.

With today's technology, this translates to mean that access to Libraries' Online Public Access Catalogs as well as to electronic databases should be conducted through easy-to-use graphical interfaces (graphical Web browsers -- e.g., Netscape's Navigator and Communicator, Microsoft's Explorer are today's offerings) that are provided by special software operating on personal computers.

Personal computers with GUIs should be deployed throughout library premises, replacing the "dumb" terminals now used with many automated library systems. These graphical interfaces will be provided by "Client" software packages (preferably, graphical browsers; but also proprietary Windows-based clients) that are now commonly available either as commercial products.

These interfaces should also be available to users outside the library, connected by networks (LANs or WANs) or dial- in access to the library's automated system. Capabilities to download graphical software packages to users' personal computers, on-demand, should be a goal for provision of easy-to-use and in some cases specialized interfaces. It may be expected that different graphical clients will be required for different activities: e.g., searching the Library's Online Catalog and/or the Internet through graphical

browsers, versus using a proprietary Windows client for processing applications such as acquisitions and cataloging. More about the requirements for suites of interfaces to be supported by the library will become known as specific systems, products, and services are selected through procurement processes.

Feasible Goals for Library Technology: Access to Digital Information Resources

Access to electronic databases and other digital information resources, both locally (e.g., on-campus and off-campus, within or without the library's parent institution) including library's Online Catalogs, commercial databases, and other resources available nationally and worldwide through Internet should be a major goal of new systems and services for libraries. The availability of electronic databases and books is already a fact of life on Internet. More digital books, and the emergence of commercially-provided libraries digital libraries will come.

The new Library and Information services should be made available through easy-to-use popular interfaces to readers both within the Library as well as those connected to the library through various telecommunications systems and networks.

Feasible Goals for Library Technology: Connection to the Internet

Public access to Internet through easy-to-use graphical Web browsers should be available to readers within the library. Increasingly, the world's digital information resources are becoming available over networks (in contrast to CD-ROM), including the Internet.

A Vision for Public Access to Information in All Formats -- from the Library's Point of View

The Library's information strategy would be to provide users of the library with coherent access both to traditional print-form (analog) books and journals in Library collections, as well as to digital information resources available through the Library's wide-area network on computers throughout The Library system, as well as from information services and sources accessible through the Internet/World Wide Web. Readers' access to information will be "network-centric" -- readers will be connected electronically to catalogs and indexes of information in the Library's print collections and electronic databases, and to full-text, abstract, and index databases available from commercial providers on a subscription and pay-for-view basis from computers on the Internet/WWW.

The goal of information technology in Library facilities shall be to provide readers with the best possible access to needed information in both print and electronic formats, and to give taxpayers and other funders the best possible return on the Library's investments in Analog and Digital Information Resources.

The Library's vision is to deliver to readers at workstations on library premises ready access to the rapidly emerging Digital Library World of the Internet/World Wide Web. This comes at a time when the fundamental role of free public libraries in our society is challenged by the emergence of electronic information resources that must be paid for at prices not affordable by all.

The tradition of free public libraries is at risk at this precipitous moment in the advent of the Digital Age, as the trend of providing electronic information on a pay-for-view and subscription basis is clearly growing.

Table 2-1 lists possible technologies and services for consideration by libraries.

TABLE 2-1

KEY TECHNOLOGIES AND SERVICES TO BE CONSIDERED FOR LIBRARIES

- Library Intranet
- Network PCs and Simply Interactive PCs (SIPCs)
- Managed LAN and WANs
- Managed PCs
- Applet Servers
- Integrated Library System Server
- HTTP/Z39.50 Server to Support 300 Users
- Intranet Server
- Internet Server
- Network CD-ROM Server for Hosting CD-ROM Databases
- Network Database Server to Support Many Simultaneous Provide Data Storage for Electronic Text Resources
- Administrative Applications Server
- Network Media Server
- Multimedia Workstations
- Desktop Video Conferencing
- Video Conferencing Theater
- Video Conferencing Production Studio and Equipment
- Satellite Download and Uplink
- Assistive Devices for Physically-Challenged Users
- Patron Self-Charge Workstations
- Computer Lab for Training and Digital Literacy Programs
- Audio Visual Production Facilities
- Audio Visual and Film Theater
- Job/Career Center
- Kiosks

- Compact Book Storage
- Smart Cards for Staff and Users
- Security and Monitoring Systems
- Outsourcing of Selection and Technical Processing of Library Materials

A Vision --- from the User's Point of View -- for Use of Information Technology in the Library

- Throughout the building I will be able to get help in using the Library from staff in red kimonos who are available in all public services areas, as well as through the use of computer workstations and kiosks that video conference me with staff at their service stations who will provide me with Video Conference Help Services.
- Upon my first use of the renovated Library I will be issued a "Smart ID Card" (sponsored by local businesses) that gives me:
  Physical access to restricted areas within the building
  Electronic access to restricted, or "for-pay," digital information resources.
- I will be assigned a "PIN -- a Personal Identification Number" that will allow me to electronically access designated information resources for which the Library must specifically authorize me.
- There will be computer workstations throughout the Library that will connect me to the Library's Help Services, and to electronic catalogs and indexes of the Library's book and journals and to the library's electronic information resources.

  These workstations will be installed with Web Browsers and other interfaces with which I am familiar.

  If I have difficulty using the workstation, I will be able to click on a button that connects me with the Library's Video Conference Help Services.
- I will be able to save electronic files that the Library will store for me in my Private Electronic File that only I can access, through the use of my Smart ID Card and my PIN (Personal Identification Number). When my Private Electronic file fills up, I will be asked to remove information before I can store more.

  I will be able to email information from my Private Electronic File to my own Internet address that I have provided for myself.
- I may bring my personal computer to the Library and "plug-in" to the Library network, and download wanted information that I can take away with me, or email to myself at my own Internet address.
- I can also dial-in from my home or office computer to the Library's network, and through the use of my PIN, gain access to the Library's electronic resources, and request books for pick-up by me there, or delivery to a branch library convenient to me.
- I will be able to print-out certain types of electronic information in hard copy that I may take away with me. I understand that I may print out some electronic information free-of-charge, but that I may have to pay for other print-outs.
- I will be able to make photocopies of the Library's print resources, for which I will have to pay.
- I will be able to "charge" photocopying and print-outs to my Library account that only I can access through my Smart ID Card and PIN.
- I understand that while the Library has subscribed to many electronic information resources that I can use free of charge, I can also access through the Library's network hundreds of others on the Internet/World Wide Web, some of which are free, and some of which are available to me only on a "for-pay" basis.

  I will be able to use some of these "for-pay" resources by paying for them from my Library Account, to which I can make charges using my Smart ID Card and PIN.
- I can telephone or dial-into the Library network to get a calendar of upcoming events and to make reservations for lectures, programs, distance learning classes, and video conferences. I understand some of these events are free of charge, and that I may have to pay for others.
- I can also make suggestions and arrangements with the Library for it to participate in video conferences and distance learning programs that I may attend without charge, or to allow me to

use their facilities for these types of services on a for-pay basis.

PART 3:

THE NETWORK-CENTRIC DIGITAL LIBRARY WORLD

This section illustrates the "Network-Centric" nature of libraries in the Digital Age.
Figures 3-1 and 3-2 show that, for the present, "getting onto the Internet" is the way for libraries to gain access to their local Community Information Infrastructure (CII), their National Information Infrastructure (NII), and the Global Information Infrastructure (GII).

As global, national, and regional Telecommunications, Television, and Cable Television companies continue to ally and merge, other avenues for connection to the NII will emerge.

Figure 3-1 outlines a Global Information Infrastructure "cloud" that connects to National Information Infrastructures, or "clouds". For a community to connect to the Internet, and through it to the NII and GII, it needs to have a "Local Community Information Infrastructure".

Figure 3-2 illustrates the type of "Emerging Local Digital Information Environment" that is coming rapidly to many areas of the world, where schools, libraries, colleges, universities, and individuals will be participants in the Local and National Information Infrastructures. This figure calls attention to the unfolding future in which individuals in the home and workplace will become the targets of information-providers. ***The same people who are today's customers of libraries -- especially the users of Analog Information -- will become tomorrow's targets for everyone selling Digital Information.***

The simplest "Local Information Infrastructure" for access to the Internet would be a PC with a modem that could dial-in to an Internet provider.

Figures 3-3 and 3-6 illustrate the needed "Library Information Infrastructure" that includes a Local Area Network (LAN), PCs, and a high-bandwidth connection to the Internet, possibly through a Wide-Area Network (WAN). Universities worldwide need to take immediate steps to provide sufficient LAN/WAN bandwidth. The bandwidth goal as of 1998 for large campus networks should be 1 GB/sec.

Figure 3-4 and 3-5 show how commercially-provided technologies can be networked through LANs/WANs/Internet/WWW to provide to new levels of "Library Resource-Sharing in a Network-Centric World."

Figure 3-6 outlines a four-step sequence by which Libraries can implement the necessary Information Infrastructure and plug-in to the "Network-Centric Digital Library World."

Figure 3-1
Information structure

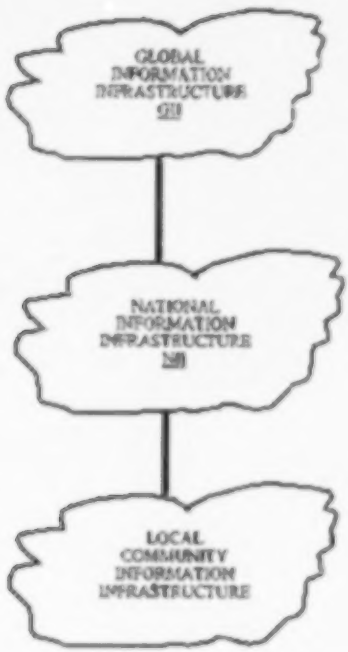

Figure 3-2
Emerging community digital information environment

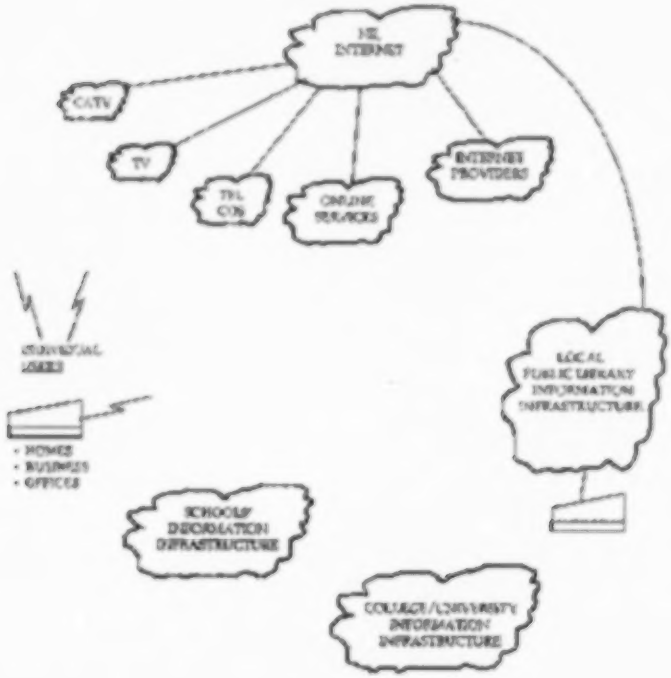

Figure 3-3
Estimated bandwidth requirements for a library and education network

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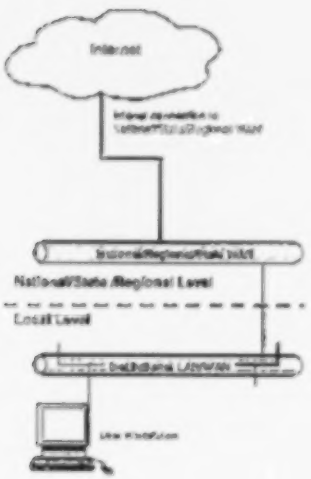

	Text	Images	Multimedia
		-	
	8 Mb/sec	20 Mb/sec	100 Mb/sec
	10-100 Mb/sec	100 Mb/sec	1 Gb/sec
	10-100 Mb/sec	100 Mb/sec	1 Gb/sec
	1 Kb/sec	S 1.5 Mb/sec	1.5 Mb/sec

RMG Guidelines for Average Library Bandwidth Requirement:

(a) Average for ASCII Terminals: [3]2 kbps

(b) Average for Personal Computers: [3]12 kbps

Figure 3-4
Statewide/regional library network architecture

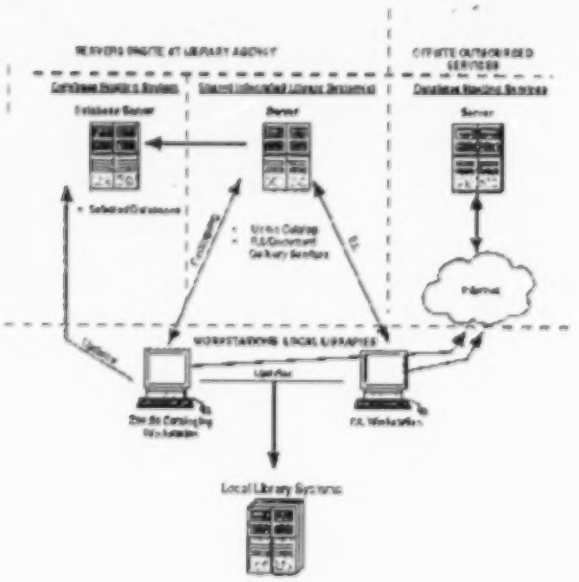

Figure 3-5
Standards based library network

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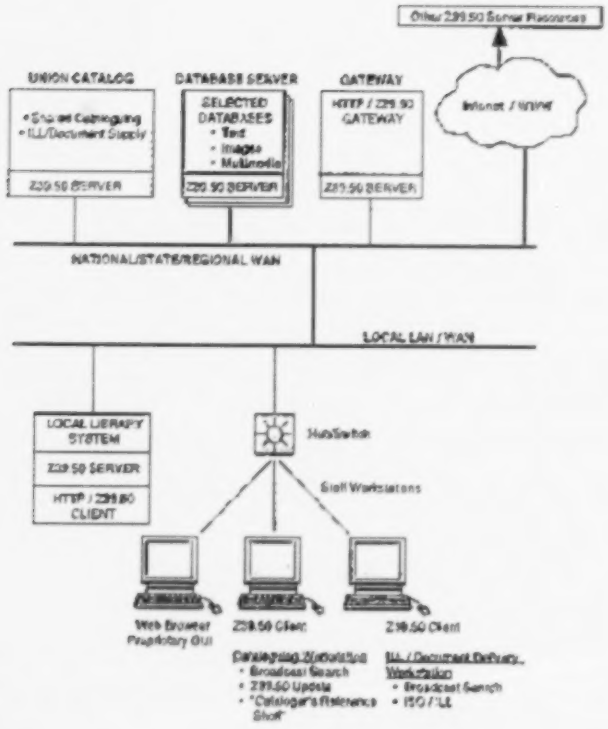
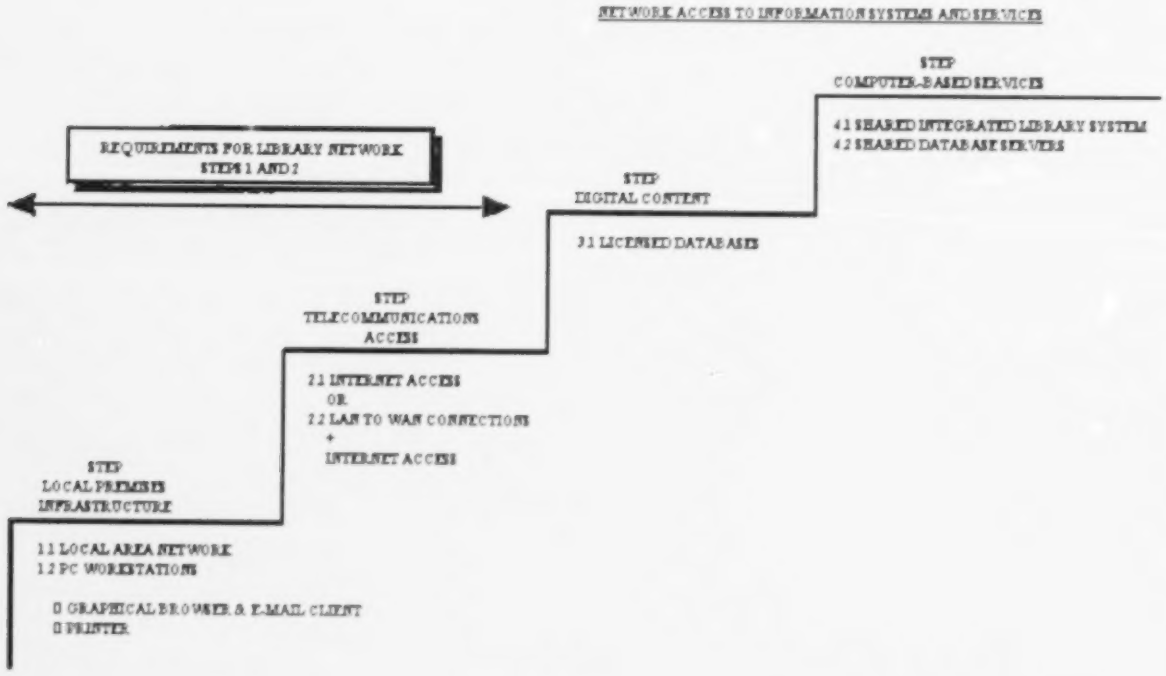


Figure 3-6
Four-step implementation strategy



PART 4:

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LIBRARY RESOURCE-SHARING IN THE NETWORK-CENTRIC WORLD

As libraries poise to offer new and enhanced services for the next century, they should review and update their mission statements, provide appropriate Local Information Infrastructure for themselves, and be willing to adapt and re-structure their organizations and operations in order to become full participants in the "Network-Centric Digital Library World." To do this will position them to engage in an array of new and renewed Library Resource-Sharing opportunities. Table 4-1 is offered as a framework for considering "Possibilities for Library Resource-Sharing in the Network-Centric Digital World."

Today's library organizational and staffing patterns are based upon models developed to meet the needs of library services in the Analog Era. It is time for libraries to assert new roles for themselves in the Digital Age, and to adapt, re-invent, and re-cast themselves in ways that carry forward and continue their mission, values, and ethics as society's information providers.

In the Analog Era libraries and commercial book sellers complemented one another. In the Digital Age it seems but a matter of time until libraries will find themselves in competition or partnership -- or both -- with providers of digital information who will target every home, school, and office -- and libraries as well -- through telecommunications delivery channels. This is an excellent time for libraries to become entrepreneurial, in order to be successful agents of correct missions, values, and ethics in the Information Age. The considerations outlines in Table 4-1 are meant to stimulate thought and discussion of these possibilities.

TABLE 4-1
POSSIBILITIES FOR LIBRARY RESOURCE-SHARING IN THE NETWORK-CENTRIC WORLD

1. Sharing of Physical Facilities
    - Storage of
        - Little-used materials
        - Distributed collections accessible through Virtual Union Catalogs
    - Host Site for Computer Operations
    - Host Site for Network Operations,
        - To manage LANs/WANs/PCs
2. People and Expertise
    - Planning
    - Management
    - Operations
    - Financing
    - Skill sets: e.g.,
        - Internet-based Reference services
        - Information Literacy
3. Telecommunications Networks and Services
    - WANs
    - WAN Standards, Management, and Operations
    - LAN Standards, Management, and Operations
    - Internet Access and Services:
        - Internet 2
        - Next Generation Internet
4. Computer System Hardware, Software, Subsystems, Standards
    - Shared Special-Purpose Systems: e.g.,
        - Shared CJK System (or other special database- related systems)
        - Union Database Superhost, with Distributed Local Library System Nodes
        - Virtual Union Catalogs
        - Third-Party ILL/Document Delivery Systems/Services
        - HTTP/Z39.50 Gateway Server
        - Database Server
        - Digital Library Servers

        - Interlibrary Loan/Document Delivery Systems and Services
    - Declaration of PC Standards
    - Declaration of LAN Standards
    - Declaration of File Server Standards
    - Remote Management of PCs, LANs, File Servers
5. Networked Information Services
    - Consortium (Group) contracts for access to electronic databases
    - Virtual Union Catalogs
    - Digital Libraries
    - Interlibrary Loan/Document Delivery Systems and Services
    - Outsourced Automated Library Systems
    - Outsourced Selection, Acquisitions, Cataloging, and Preparation (Technical) Services
6. Data and Data Conversion Projects/Cataloging Services: e.g.,
    - Shared cataloging in designated subject areas
    - RECON Projects
    - Imaging Projects
    - Electronic Course-Reserve Imaging Projects
7. Library Materials
    - Interlibrary Loan
    - Collection Development
8. Persuasion of Permission-Givers
    - Boards
    - Member Libraries
9. Other Processes for Specific Goals
    - Joint Procurements
    - Fund-Raising
10. One-Time and Ongoing Costs

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